Io and Europa: Science Plans and Expected Data Return from Galileo's Near Infrared Mapping Spectrometer (NIMS)

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On December 7. 1995, the Galileo spacecraft will begin observations in a two year tour of the Jovian system. The NIMS instrument. covering the wavelength range 0.7 to 5.2 microns, will image the Galilean satellites and return a wealth of new. first-of-its-kind spatially resolved near-infrared data. The science objectives and expected science data return for Io and Europa will be discussed, focussing on the science to be acquired during Jupiter Orbit Insertion (JOI) in December 1995, when the spacecraft will make its closest approach to Io and obtain the highest resolution view of Europa's southern polar region. The observing plans and selected observation designs for Io and Europa will be presented in companion papers by Herrera et al. and Ocampo et al. The major science priorities for NIMS at Io are determining surface composition, temperature, and heat flow; investigating atmospheric composition; and establishing temporal variability for different types of volcanic activity. NIMS will map the distribution of S02, silicates, and other species on Io's surface on both global (> 100 km/NIMS pixel) and local scales (5-25 km/NIMS pixel), using between 102 and 408 wavelengths. During JOI, limb scans will place limits on the atmospheric density of S02 and investigate its source; and will obtain temperature and compositional variations of active plumes. Observations acquired during the two-year tour will monitor the volcanic activity and map the distribution and temperature variation of hot spots down to ! 80 K. The NIMS science objectives for Europa wiII focus on the issues of global resurfacing, heat flow, and surface composition. NIMS will investigate different surface units by detecting small compositional changes in surface ice, which could indicate different source regions or ages for the ices, and provide clues to the temperature of melts which formed the surface. NIMS will search for thermal anomalies (> 180K) on Europa's nightside, will map the distribution of S02 implanted on the surface and will search the polar regions for species more volatile than water. A quantitative inventory of these species will be essential for the identification of the composition of Europa's sub-surface materials.

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